

CBNL
Byron House
Cambridge Business Park
Cowley Road
CAMBRIDGE, UK
CB4 0WZ

5 September 2016

To Whom It May Concern:

re: New band plan for 39GHz band

Section IV.B.5 of the Report and Order FCC 16-89 changes the band plan for the 39GHz (38.6—40 GHz) band from the pre-existing plan, shown in figure 1, to a new plan shown in figure 2.

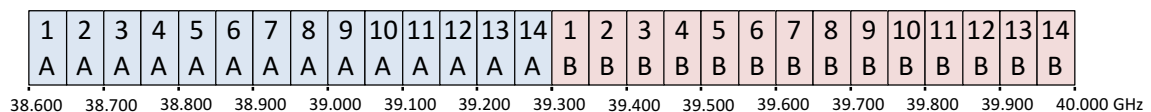


Figure 1: Prior band plan for 39GHz band

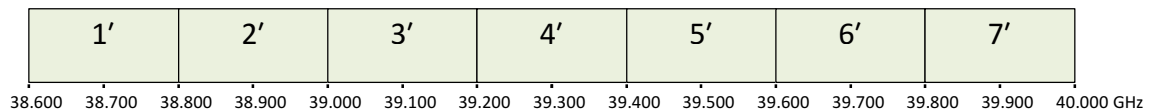


Figure 2: New band plan for 39GHz band

The reconfiguration is intended to “remove obstacles to TDD schemes while still allowing for flexibility to accommodate FDD” (§96). Because of the paired spectrum block nature of the former band plan, usage to date of this band makes use of FDD.

While the new band plan is able “to accommodate FDD” per se, it does not easily accommodate existing FDD users of the band. This is because the pre-existing Transmit-Receive (T-R) spacing is 700MHz, which is not divisible by the new block size of 200MHz. The effect of this is shown in figure 3.

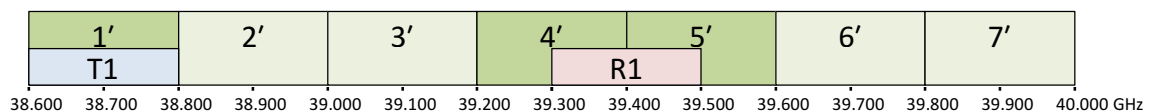


Figure 3: Poor accommodation of FDD systems using established 700MHz T-R spacing in new band plan

Here we can see that an existing FDD system, making use of 200MHz of spectrum for both ‘go’ and ‘return’ directions, actually needs three 200MHz channels (1', 4' and 5') to be licensed to its operator. (We note that the T-R spacing of a system is not typically field configurable, usually being physically realised as tuned cavity resonator bandpass filters).

The requirement, under the new band plan, to license 600MHz of spectrum in order actually to make use of 400MHz of that spectrum, is likely to constitute a significant financial penalty against FDD usage.

CBNL propose that the new band plan be altered slightly as shown in figure 4. This reduces the number of 200MHz channels from seven to six and introduces two 100MHz channels.

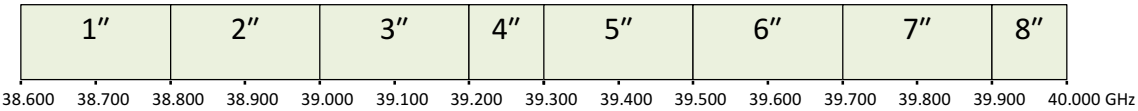


Figure 4: Proposed modified new band plan

This modified band plan still meets the objective of permitting both TDD and FDD, but it has additional benefits.

Firstly, as shown in figure 5, pre-existing FDD systems with a 700MHz T-R spacing are accommodated with no idle spectrum.

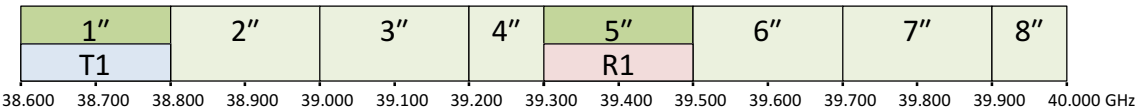


Figure 5: Superior accommodation of existing FDD systems using established 700MHz T-R spacing

This figure illustrates that, under the proposed scheme, only two of the new channels are required to operate the same link as shown above in figure 3 (1'' and 5''). This removes the penalty for FDD operation described above without penalizing TDD operation in any way. Because the adjacent 37GHz band (about which we make no comment) provides a further seven 200MHz channels, we do not believe that the reduction in the total number of 200MHz channels in the 37.5 – 40.0GHz band, from 14 to 13, is significant overall.

The proposed band plan is also more equitable in that it equalizes the minimum investment in 39GHz spectrum for FDD and TDD approaches.

Under the current scheme, a TDD system requires a minimum of 200MHz spectrum, one new channel. However, even a hypothetical FDD system with a T-R spacing divisible by 200MHz would, because of the need for separate transmit and receive frequencies, require a minimum of two channels; in other words, 400MHz.

The proposed scheme makes provision for an FDD system to use a total amount of spectrum of 200MHz, by using channels 4'' and 8'' as a pair.

Flexible Duplexing Rules

Regarding the relative merits of TDD and FDD per se, while being in favor of the flexible duplexing rules that other commenters “overwhelmingly support” (§268), CBNL also offer the following comments.

To date, FDD operations predominate in licensed wide area operations. This is largely due to the simplicity of interference avoidance afforded by such a system design, both for a single network operator with a multi-cellular network and for multiple, collocated network operators using adjacent channels.

One may regard the T-R spacing and front-end filtering of an FDD system as being a way to implement, in a distributed way, an interference avoidance function. By contrast, without

temporal coordination of T-R scheduling, colocated TDD systems in adjacent channels will mutually interfere with one another. Implementing this temporal coordination adds complexity to the TDD system and constrains the variation of uplink/downlink ratios, often cited as a principal advantage of the TDD approach. We note that such coordination may be difficult or impossible to achieve where differing, mutually incompatible, systems are deployed in adjacent channels.

Contrariwise, if a transmitting TDD system is constrained not to cause interference to an unsynchronized, colocated receiving TDD system in an adjacent channel, the necessary filtering to give the required isolation will, in a practical realization, reduce the available channel bandwidth to a significant extent. (Comparatively, in an FDD system, the receiving channel is separated from the transmitting channel by the T-R spacing, so the filter roll-off can be 'spread' across a large bandwidth).

Finally, we note the difficulty of coordination between a TDD system and an FDD system. Because an FDD system transmits continuously on one frequency, there is no way to arrange a spectrally adjacent TDD system's T-R schedule such that it does not suffer interference when trying to receive. Likewise, when a TDD system is in use adjacent to the receive channel of an FDD system, there is no way to arrange the T-R schedule of the TDD system such that the FDD system does not suffer interference.

While licensed bands with flexible duplexing rules do exist worldwide, we are not aware of any such bands where both TDD and FDD systems have been deployed at a commercial scale. Given the amalgamation of the 37 and 39GHz bands, it may be prudent to allocate TDD channels upwards from 37.5GHz and FDD channels downwards from 40.0GHz, to allow the greatest scope for harmonious coexistence.

Yours faithfully

Dr John Naylor
CTO
Cambridge Broadband Networks Limited